

Use of zeolite in maize (*Zea mays*) cultivation on nitrogen, potassium, and phosphorus uptake and use efficiency.

ABSTRACT

Concerns about unbalanced use of fertilizers leading to environmental pollution have been globally expressed. As a result, studies on how to use efficient methods to reduce nutrient applications at the same time increasing or maintaining crop yield, reducing nutrient losses and improving nutrient use efficiency are imperative. Nutrient loss due to leaching, volatilization and fixation upon fertilizer application to soils may be reduced through the use of slow-release fertilizers. A pot study was conducted to investigate if the use of inorganic fertilizers together with zeolite will improve nitrogen (N), phosphorus (P) and potassium (K) uptake and efficiency in maize (*Zea mays*) cultivation on Nyalau series (Typic Paleudalts). Maize hybrid no. 5 variety was used as test crop. Treatments evaluated were: (i) Unfertilized condition (T1), (ii) normal N, P and K application (7.4 g urea + 11.3 g Christmas Island rock phosphate (CIRP) + 3.8 g muriate of potash (MOP)) (T2), (iii) 135 g zeolite + 5.92 g urea+9.0 g CIRP + 3.0 g MOP (T3), (iv) 270 g zeolite + 4.44 g urea + 6.8 g CIRP + 2.3 g MOP (T4), (v) 405 g zeolite+3.0 g urea+4.5 g CIRP+1.5 g MOP (T5) and (vi) 540 g zeolite + 1.5 g urea + 2.3 g CIRP + 0.8 g MOP (T6). The effect of T2, T3, T4, T5 and T6 on soil N, P and Mg at harvest was not significantly different compared with T1. However, treatments with zeolite significantly increased K and Ca contents of soil compared to T1. Irrespective of treatment, dry matter production was not different. However, nutrient concentrations determined in plant tissues were clearly affected by the addition of zeolite. N, P and K uptake varied significantly but T6 significantly affected N, P and K use efficiency. The use of inorganic fertilizers mixed with zeolite remarkably increased N, P and K uptake, and their use efficiency in leaves, stem and roots. The use of zeolite could be beneficial with respect to nutrient retention in soil and their use efficiency.

Keyword: Zeolite; Inorganic fertilizers; *Zea mays*; Nutrient uptake; Nutrient use efficiency.